Abstract Submitted to the
International Conference on Strongly Correlated Electron Systems
University of Michigan, Ann Arbor
August 6-10, 2001

Confined-Field-Induced-Density-Waves in Superconductors With Gap Nodes

Georgios Varelogiannis[1], Michel Héritier[2]

[1] *Institute of Electronic Structure and Laser, FORTH, P.O. Box 1527, 71110 Heraklion, Greece*

[2] *Laboratoire de Physique des Solides, Université de Paris-Sud et CNRS, 91405 Orsay, France*

We reveal a magnetic field induced first order transition from a d-wave superconducting (SC) state to a state in which SC $coexists$ with Confined-Field-Induced-Density-Waves (CFIDW) that develop in the gap node regions. The momentum extension of the CFIDW over the Fermi Surface is $quantized$. For each Landau level configuration correspond more than one momentum extensions of the CFIDW leading to a $fractional\ quantization\ of\ the\ superfluid\ density$. Our picture fits with precision the "plateaus" phenomena and their behavior in thermal conductivity of Bi-2212 (Krishana $et\ al.$ Science **277**, 83 (1997)) and the field induced reduction of the superfluid density as well (Sonier $et\ al.$, Phys. Rev. Lett. **83**, 4156 (1999)). It also explains naturally the experimental controversy around the "plateaus" issue including the remarkable sample dependence of the occurence of the phenomenon. This novel field induced macroscopioc quantum phenomenon may manifest only in extremely clean samples because $confined$ in momentum space (very large in real space) cyclotron orbits are in game. We identify puzzling phenomena in other unconventional superconductors in which our CFIDW states may also be involved.